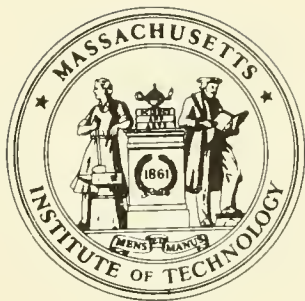


BASEMENT



LIBRARY
OF THE
MASSACHUSETTS INSTITUTE
OF TECHNOLOGY

D28
M414
809-75

DEC 12 1975

LIBRARY

MASS. INST. TECH.

NOV 14 '75

DEWEY LIBRARY

WORKING PAPER
ALFRED P. SLOAN SCHOOL OF MANAGEMENT

TRADE EFFECTS OF THE OIL CRISIS

by

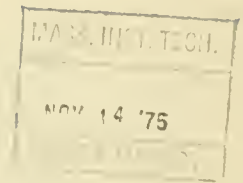
Tamir Agmon^{*}
Arthur B. Laffer^{**}

WP 809-75

September 1975

MASSACHUSETTS
INSTITUTE OF TECHNOLOGY
50 MEMORIAL DRIVE
CAMBRIDGE, MASSACHUSETTS 02139





TRADE EFFECTS OF THE OIL CRISIS

by

Tamir Agmon*
Arthur B. Laffer**

WP 809-75

September 1975

The authors are grateful for comments from Sidney Alexander, Fischer Black, Victor Canto, Rudiger Dornbusch, James Paddock, Michael Schmid, and David Ransom.

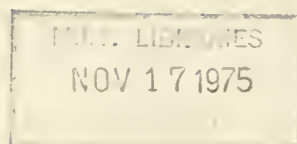
* Sloan School of Management, M.I.T. and Graduate School of Business,
Tel-Aviv University

** Graduate School of Business, University of Chicago

HD28

M41-1

no 809-75



I. Introduction and Summary

The issue of energy and the quadrupling of the price of oil spans many areas of economics. One of the main concerns of economists and policy makers alike is the impact of the elevation of oil prices on the adjustment processes of the trade and payments balances of the oil exporting and the oil importing countries.¹ Although countries are aware of the adverse effect of trade restriction their actual decisions are affected by the nature of the adjustment processes in the world's payments balances.²

The expected changes in the flows of international trade in oil are playing a most important role in all the forecasts of OPEC capital surplus -- one of the crucial variables in analyzing energy-related developments in the international capital market. A brief examination of some of the current forecasts by major banks, like FNCB [3], Morgan Guaranty [6], private consultants, like Levy [5], or world organizations like IBRD [4], reveals that much of the differences among them can be attributed to different assumptions about the future patterns of trade between the oil exporting and oil importing countries.

Many attempts to analyze the adjustment processes in the trade and payments balances of both the oil exporting and oil importing countries were based on an estimation of the "absorptive capacity" for imports by the OPEC members. In an analysis of the international developments in the first half of 1974 as well as in a forecast for the rest of 1974 and 1975

¹See Alexander [1].

²The U.K., for example, has made its commitment to non-restricted trade and financial flows conditional on "proper" adjustment processes. See Alexander [1].

the OECD regards the problems associated with the adjustment processes of the trade balances as serious.³ Their analysis is based on a relatively low "absorptive capacity," and the OECD has expected: "The outlook to the end of 1975 is for the trade picture to become extremely weak, reflecting virtually stagnant demand (of OPEC for OECD exports), with some turn-around in the area's (OECD) terms of trade. . ."⁴

The high, and unexpected, imports by OPEC during 1974 brought about a more optimistic forecast extrapolating OPEC demand for imports at a similar rate to 1985.⁵

This paper specifically addresses the issue of the nature of the process of the adjustment in the balance of payments following the quadrupling of the price of oil at the outset of 1974. An understanding of this process within a framework of a general model should contribute to a better understanding of the relevant factors determining the adjustment process and thus the "absorptive capacity" of OPEC and the resulting trade surpluses (or deficits).

The first section of the paper looks at the trade balance effects of the rise in the price of oil from a theoretical vantage point. The basic results from theory are that generally trade balances should in the long run be unaffected by the rise in the price of oil. In the short period, trade balances of oil importing countries should worsen as expenditures are more slowly brought into line with income. Depending

¹See OECD [7], pp. 52-64.

²Ibid., p. 52.

³See FNCB [3], p. 11.

upon the speed of adjustment, trade balances would be expected to revert to their original levels.

The process of adjustment and the ultimate equilibrium could occur through several channels. Oil imports could fall, nonoil imports could fall, or nonoil exports could rise.⁶ In general, there is little presumption as to which route, or routes, will actually materialize. Both oil and nonoil should experience similar (in direction) income effects, whereas oil will have substitution effects working to lower net imports. Nonoil products will experience substitution effects that will tend to increase net imports.

The next section in the paper is devoted to an analysis of the overall balance of payments. Following along the lines of the monetary approach to the balance of payments, an increase in the price of oil should result in changes in the distribution of the world monetary reserves. The price rise leads to changes in the distribution of income and hence alters money demands. These shifts in money demands result in balance of payments surpluses and deficits until a new equilibrium is attained. In the long run, the rise in the price of oil will lead to a change in the distribution of world reserves and not to permanent balance of payments surpluses or deficits. Depending upon the time required for this new equilibrium to be attained, countries intensive in the production of oil will run balance of payments surpluses and the other countries deficits. These deficits and surpluses should not persist in the long run.

The final section of the paper looks directly at the empirical evidence

⁶The OECD reports that the trade "losses" due to the increase in the price of oil were: "offset to a surprising extent by a saving of the volume of trade balance," that is by an increase of nonoil exports by OECD. See OECD [7], p. 52.

The general findings are as follows:

- ' Trade balances of the industrial countries deteriorated markedly immediately following the price increase for oil.
- ' Since the initial deterioration, these trade balances have again improved and are almost back to their pre-price hike levels.
- ' The adjustments in the trade accounts are almost exclusively in non-oil trade. The oil exporting countries have demonstrated a substantial absorptive capacity of imports.
- ' Balance of payments of industrial countries deteriorated sharply following the rise in the price of oil. Balance of payments of oil-exporting countries improved even more precipitously. In other words the share of international reserves held by the oil exporting countries have increased substantially over 1974.
- ' Since the initial change in the overall balance of payments, there has been a reversion to more normal deficits and surpluses.

II. The Effects on Countries' Trade Balances

A. Small Country Analysis

Let us define a small country as a country that accepts as a datum all relative prices. Within the context of the small country assumption, there are three all-inclusive markets. The first market is the market for oil. The second and third markets are for all other goods and bonds, respectively. In this instance, the bonds market includes claims on all future real goods streams (oil and other goods inclusive).⁷

Implicit in the analysis is an aggregate supply of factors of production. Each factor supplies its services in order to acquire some combination of the three comprehensive commodities, i.e., oil, other goods, and bonds. Within the context of the above framework, factors of production can directly produce only oil or other goods. They cannot directly produce bonds on a net basis.

The excess demand in each of the commodity markets depends directly on the relative prices in the overall system. Thus, the excess demand for oil depends inversely on the price of oil in terms of other goods and also inversely on the price of oil in terms of a fixed real yield bond. on the demand side, the higher the price of oil, the less oil the small country will demand and, conversely, the more of other goods or bonds they will demand. On the supply side, as the prices of oil rise, the more oil will be produced. In part, resources will shift out of the production of other goods and into the production of oil. In addition, with higher real yields on bonds for each unit of oil produced, there will be some resources

⁷ In this analysis money per se is ignored. International reserves are viewed as short-term bonds.

used to produce oil that were previously idle. In total, therefore, as the price of oil in terms of both other goods and bonds rises, the demand for oil falls and the supply of oil rises. Thus:

$$(1) \quad ED(oil) = ED_o(P_{o/g}^-, P_{o/b}^-), \frac{8}{}$$

where

ED_o = excess demand for oil

$P_{o/g}$ = price of oil in terms of other goods

$P_{o/b}$ = price of oil in terms of bonds.

Similarly:

$$(2) \quad ED_g = ED_g(P_{g/o}^-, P_{g/b}^-)$$

and

$$(3) \quad ED_b = ED_b(P_{b/o}^-, P_{b/g}^-),$$

where

ED_g = excess demand for other goods

ED_b = excess demand for bonds

$P_{g/o} = 1/P_{o/g}$

$P_{b/o}$ = price of other goods in terms of bonds

$P_{b/o} = 1/P_{o/b}$

$P_{b/g} = 1/P_{g/b}$.

⁸The sign above the arguments contained within the parentheses represents the partial derivative of the overall function with respect to the argument.

Because the three commodity markets are all-inclusive in terms of a general equilibrium framework the sum of all excess demands must equal zero; i.e.,

$$(4) \quad ED_o + ED_g + ED_b = 0.$$

With this framework, we can analyze the effects of exogenous changes in $P_{o/g}$, $P_{o/b}$, and $P_{g/b}$, recognizing that

$$P_{o/g} = P_{o/b} \cdot P_{b/g}.$$

In words this means that the price of oil in terms of other goods must equal the price of oil in terms of bonds times the price of bonds in terms of other goods.

In order to analyze the effects of a rise in the price of oil in terms of other goods, $P_{o/g}$, one finds that there are two possible polar cases. In the first case, the rise in the price of oil in terms of other goods could be fulfilled entirely by a rise in the price of oil in terms of bonds. In this case, the price of bonds in terms of goods remains unchanged.

Using our nomenclature, we have

$$P_{o/g} \uparrow, \quad P_{o/b} \uparrow, \quad P_{b/g} \rightarrow$$

and

$$\begin{aligned} &ED_o(P_{o/g} \uparrow, P_{o/b} \uparrow) \downarrow \\ &ED_g(P_{g/o} \downarrow, P_{g/b} \rightarrow) \uparrow \\ &ED_b(P_{b/o} \downarrow, P_{b/g} \rightarrow) \uparrow \end{aligned}$$

Thus, from the point of view of a small country facing world prices, a rise in the price of oil relative to other goods matched by a rise in the price of oil in terms of bonds will lead to an excess supply of oil and excess demands for both bonds and other goods. Equilibrium is restored in the small country case entirely via trade. The small country's net imports of oil will fall (net exports rise). Likewise, the country's net exports of other goods will fall as well its net exports of bonds.

Looking at the normal balance of payments accounts, we find that the trade balance of the small country would improve while its capital balance will deteriorate.

The second possible polar case arises when the increase of the price of oil in terms of other goods is matched by an equivalent rise in the price of bonds in terms of other goods. Again using our nomenclature,

$$P_{o/g} \uparrow \quad P_{o/b} \rightarrow \quad P_{b/g} \uparrow$$

and

$$ED_o(P_{o/g} \uparrow, P_{o/b} \rightarrow) \downarrow$$

$$ED_g(P_{g/o} \downarrow, P_{g/b} \downarrow) \uparrow$$

$$ED_b(P_{b/o} \rightarrow, P_{b/g} \uparrow) \downarrow$$

Again from the point of view of the small country, equilibrium is reinstated with quantity movements in the balance of payments. In this case, where the price of oil in terms of other goods rises and is matched by a rise in the price of bonds in terms of other goods, we find that the small country has an excess demand for other goods and excess supplies

of oil and bonds. The net imports of oil will fall, the net exports of other goods will fall, and the net export of bonds will rise.

Using the normal balance of payments accounts, we find that in this instance the trade balance worsens and the capital account improves.

Knowledge of the change in the price of oil in terms of other goods does not tell us whether the small country's trade balance will improve or worsen. Knowledge of whether the country is a net exporter or importer of oil originally also does not help us in determining the effect on the trade balance. The answer to the question of whether the trade balance changes depends solely on the distribution of this relative price change as between real returns to a unit of oil foregone and a unit of other goods foregone.

B. Closing the World Economy

Little changes in the implications of the analysis once we close the world economy. Even in a fully closed world economy, one is still unable to determine the effects on the trade balance of a rise in the price of oil in terms of other goods. The basic difference in the analysis of a small open economy and a closed world system is that one must specify the source of the rise in the price of oil in terms of other goods.

In a static framework, a rise in the price of oil in terms of other goods comes about from an incipient excess demand for oil matched by an incipient excess supply of other goods. This can result from any combination of the following:

- (a) reduction in the supply of oil, (OPEC action appears to fall under this category).

- (b) increase in the demand for oil
- (c) reduction in the demand for other goods, and
- (d) increase in the supply of other goods.

For the world as a whole, the supply of oil or the income derived from the production of oil must equal expenditures on oil. Similarly, the income derived from the production of other goods will equal expenditures on other goods. In the overall world context, total expenditures will equal total income irrespective of the numeraire selected. Changes in expenditure must also equal changes in income.

Everything else allowed to move, we find that the total change in expenditures must equal the total change in income. Other factors the same across countries, the change in a country's income will be roughly equal to a change in its expenditures. Without a great deal of further specification, the change in the difference between a country's income and its expenditures (i.e., changes in its trade balance) is unknown. If a country's rise in income is associated with an excess demand for bonds, then the trade balance will improve. Income will rise more than expenditures. If, however, a rise in a country's income is associated with an excess supply of bonds, then the trade balance will worsen. In this case, the rise in income is less than the rise in expenditures.

Therefore, in a general equilibrium context the trade balance result depends upon relative shifts in the excess demand for bonds across countries. Countries where the relative excess demand for bonds rises will tend to have trade balance surpluses, while countries whose relative excess demand for bonds falls will tend to have trade balance deficits.

In analyzing the trade balance effects this way, we have to see what the effects of a rise in the price of oil in terms of other goods are on the distribution of the stock of future income-earning assets. To do this, we first must consider whether the rise is perceived as temporary or as permanent.

In the case of the current increase in the price of oil, the rise will be perceived as temporary or permanent as a function of the expectations with regard to the stability and the market power of the OPEC cartel. If one believes that all cartels are inherently short lived and unstable then the price rise may be perceived ex ante as temporary. If, on the other hand, the cartel is believed to be stable in the relevant horizon then the price rise will be taken as permanent. Different forecasts assume different degrees of cartel effectiveness with regard to the maintenance of the current price.⁹

In the case of a temporary rise, the market value of existing oil-producing assets will tend to rise by less than the rise in the price of oil. The fall in the market value of other goods-producing assets, conversely, will tend to fall by less than the fall in the relative price of other goods. Similar statements can be made about assets that use oil and those that use other goods as inputs.

For any country, total real income measured in terms of other goods, y_g^i , is merely the sum of income derived from the production of oil measured in terms of other goods, $y_o \cdot P_{o/g}$, and income from the production of other goods, y_g . Therefore

⁹For example, see FNCB [3] and Levy [5].

$$(5) \quad y_g^\tau = y_o P_{o/g} + y_g \cdot$$

From this we can see that the percentage change in total income associated with a rise in the price of oil in terms of other goods is:

$$(6) \quad \frac{dy_g^\tau}{dP_{o/g}} \cdot \frac{1}{y_g^\tau} = \left(\frac{dy_o}{dP_{o/g}} \cdot \frac{1}{y_o} + \frac{1}{P_{o/g}} \right) \frac{P_{o/g} y_o}{y_g^\tau} + \left(\frac{dy_g}{dP_{o/g}} \cdot \frac{1}{y_g} \right) \frac{y_g}{y_g^\tau} \cdot$$

In words, the percentage change in total income (measured in units of other goods g) due to a rise in the price of oil (measured in units of g) will equal the percentage change in the physical production of oil plus the percentage change in the price of oil (measured in units of other goods) all times the share of income derived from the production of oil plus the percentage change in the production of other goods due to a change in the price of oil times the share of income derived from the production of other goods.

In general, oil-exporting nations will tend to have a larger share of income derived from the production of oil (a smaller share derived from the production of other goods). Given that the price of oil (measured in units of other goods) temporarily rises, then

$$(7) \quad \frac{dy_o}{dP_{o/g}} > 0 \text{ and } \frac{1}{P_{o/g}} > 0 \text{ and } \frac{dy_g}{dP_{o/g}} < 0.$$

From this we can see that, in general, the temporary percentage rise in income for oil-exporting countries will exceed the temporary rise

(measured in units of other goods) in income for oil-importing countries;
i.e.,¹⁰

$$(8) \quad \frac{dy_{g/e}^1}{dP_{o/g}} \cdot \frac{1}{y_{g,e}^1} > \frac{dy_{g,I}^\tau}{dP_{o/g}} \cdot \frac{1}{y_{g,I}^\tau},$$

where e and I subscripts refer to exporting or importing, respectively.

With regard to the expenditure side of the relationship, we could expect that total expenditures would depend primarily on total wealth or alternatively on permanent income. Total wealth (again measured in units of other goods) is the discounted present value of all future income flows. Therefore,

$$(9) \quad x_g^\tau = x_g^\tau (w_g^\tau) \quad \text{where} \quad w_g^\tau = \sum_{t=0}^{\infty} \frac{y_{g,t}^\tau}{(1+r)^t}$$

Insofar as the rise in the price of oil (in units of other goods) is temporary, we still will have

$$(10) \quad \frac{dw_{g,e}^\tau}{dP_{o/g}} \cdot \frac{1}{w_{g,e}^\tau} > \frac{dw_{g,I}^\tau}{dP_{o/g}} \cdot \frac{1}{w_{g,I}^\tau}$$

but

$$\frac{dw_{g,e}^\tau}{dP_{o/g}} \cdot \frac{1}{w_{g,e}^\tau} - \frac{dw_{g,I}^\tau}{dP_{o/g}} \cdot \frac{1}{w_{g,I}^\tau} < \frac{dy_{g,e}^\tau}{dP_{o/g}} \cdot \frac{1}{y_{g,e}^\tau} - \frac{dy_{g,I}^\tau}{dP_{o/g}} \cdot \frac{1}{y_{g,I}^\tau}.$$

In words, this means that while the percent increase in wealth in oil-exporting nations exceeds the percent increase in wealth in oil-importing

¹⁰If the percentage responses to a change in $P_{o/g}$ in an industry across countries differ systematically according to whether a country is a net exporter or net importer, it is conceivable that this result will not hold.

nations, the differential increase will be less than the differential increase in current income. This occurs because in future periods incomes will revert towards their original levels due to the temporary nature of the rise in the price of oil. If expenditures depend primarily on wealth, then the percentage increase in expenditures for oil-exporting countries will rise by less than the percentage increase in current income.

$$(12) \quad \frac{dx_{g,e}^{\tau}}{dP_{o/g}} \cdot \frac{1}{x_{g,e}^{\tau}} < \frac{dy_{g,e}^{\tau}}{dP_{o/g}} \cdot \frac{1}{y_{g,e}^{\tau}} .$$

The trade balance of the oil-exporting countries is nothing other than the difference between total income and total expenditures.

$$(13) \quad TB_e \equiv Y_{g,e}^{\tau} - X_{g,e}^{\tau} .$$

The change in the trade balance will therefore equal

$$(14) \quad \frac{dTB_e}{dP_{o/g}} \equiv \frac{dy_{g,e}^{\tau}}{dP_{o/g}} - \frac{dx_{g,e}^{\tau}}{dP_{o/g}}$$

Assuming that expenditures roughly equal income at the outset, i.e., $TB = 0$, then

$$(15) \quad \frac{dTB_e}{dP_{o/g}} = \left(\frac{dy_{g,e}^{\tau}}{dP_{o/g}} \cdot \frac{1}{y_{g,e}^{\tau}} - \frac{dx_{g,e}^{\tau}}{dP_{o/g}} \cdot \frac{1}{x_{g,e}^{\tau}} \right) \cdot y_{g,e}^{\tau} .$$

From equation (12) we know that $\frac{dTB_e}{dP_{o/g}} > 0$ when the rise in the price of oil is temporary. The oil-exporting countries can be expected to run a temporary trade balance surplus.

This case corresponds well to a situation where there is an evenly distributed surge in the demand for oil due to a temporary cause such as bad weather. It does not, however, correspond to an oil cartel's restrictions, albeit temporary, on the export of oil. In a restricted export case, the rise in the price of oil comes about as a result of a fall in the income from the production of oil in the oil-exporting countries. In the restriction case, one is not able to determine, in general, whether the percent increase in income exceeds the percent increase in expenditures. As in the small country case, one cannot say whether the change in the trade balance is positive or negative on purely a priori grounds.

Likewise, moving on to the case where the price of oil is seen as permanently higher, we find that the percentage increase in current income will equal the percentage increase in wealth. With expenditures proportional to wealth it follows that the percentage increase in income will equal the percentage increase in expenditures. Again, there is no reason a priori to expect any systematic tendency for trade balances of oil-exporting nations to either improve or worsen.¹¹

C. The Effects of Expenditure Smoothing

In a large number of empirical studies, consumers and investors have been found to adjust expenditure flows more slowly than income flows change. Were there no adjustment costs of adapting expenditure flows to

¹¹Several commonly held arguments would lead to the result that oil-exporting countries' trade balances would improve. These arguments rely on assumed differences in the costs of adjusting expenditure flows relative to wealth.

income or wealth, there would be little reason to expect any systematic relationship between changes in the price of oil and changes in countries' trade balances. Once we accept the notion of adjustment costs, it becomes quite reasonable to anticipate systematic, albeit temporary, changes in countries' trade balances depending upon whether the country is a net exporter or a net importer of oil.

With an unanticipated change in the price of oil, the incomes of all countries (as measured in units of other goods) rise. Likewise, on a world-wide basis expenditures also rise. The distribution of the two respective rises, however, will not be the same, holding physical outputs and demands constant.

Using pre-price quantities, countries, that were net oil-exporters will tend to find expenditures rising less than income. Similarly, countries that are net oil-importers will find expenditures rising more than income.

To the extent that expenditures tend to adjust with a lag to income, we would expect to find the following. Immediately following the rise in the price of oil, oil-importing countries will tend to run large trade balance deficits. Correspondingly, oil-exporting countries will tend to run trade balance surpluses. As time progresses, these trade balance surpluses and deficits will tend to fall toward their original levels. This retrogression back to the original levels reflects the effects of the adjustment of expenditures to the new levels of income or wealth.

Irrespective of the ultimate expenditure effects, the short-run effects in the trade balance of a rise in the price of oil will be pronounced if

expenditure smoothing occurs. These short-run effects in no way detract from the long-run effects. In the long run, there is still no reason to expect a country's trade balance to either improve or worsen because of a rise in the price of oil. The relevant question is how long it takes a country's trade balance to return to its original position.

The previous two parts of this section of the paper describe the long-run equilibrium position. In this part, the costs of adjusting expenditures to income can be thought of as a short-run willingness on the part of countries to adjust initially through holdings of wealth, i.e., bonds, and later making the necessary adjustments in total expenditures.

Given the actual situation in the world economy, theory per se does not permit a definitive response of trade balances to a rise in the price of oil measured in units of other goods. Irrespective of the net oil export position of the country, its trade balance could either improve or worsen. Whether the trade balance improves or worsens depends strictly on the degree to which expenditure smoothing occurs and on individual country differences rather than whether they export or import oil net. What does actually happen is an empirical question and will be dealt with in Section IV of this paper.

III. The Effects on Countries' Payments Balances

In a world economic system where total reserves are held constant, the distribution of reserves depends partly on the world distribution of income. Taking an oversimplified version of the monetary approach

to the balance of payments, the distribution of world reserves by country will be the same as the distribution of world income by country. Countries with high income will have high reserves, and countries with low income will have low reserves.

Even when we drop a strict proportionality assumption, larger countries will still tend to have greater reserves than will countries with low income. This follows as an indirect consequence of the demand for money being related to the total level of income. Countries with higher income generally have demand for more money balances than countries with low income.

A country in principle has two sources of its domestic money supply. One source of the supply of domestic money balances arises out of internal credit creation. The second source of the supply of domestic money balances is external credit creation, or the stock of international reserves. While the rule is by no means hard and fast, the greater a country's demand for money the more international reserves it will tend to hold.¹²

Viewing one single nation in the world economy, we would expect that as this economy's income increases so will its holdings of international reserves. As income rises, the demand for money rises and part of the increase in the supply of money to satisfy the increased demand will come in the form of increases in international reserves. Either by selling goods net abroad or by borrowing from foreigners net, the country in question will augment its domestic reserves by importing international reserves. The

¹²The formulation here fits into the framework specified by Harry G. Johnson, "A Monetary Approach to the Balance of Payments."

increase in domestic reserves permits an expansion of the domestic money supply.

Still holding the level of total world reserves constant but now looking at all countries, we find that a country must increase its income more proportionately than other countries in order to import reserves. If world real income increases and reserves don't increase, then in the aggregate the world's demand for and supply of money will be equilibrated either by changes in prices or by increases in the money supply/international reserves ratio.

Given that either prices change or the ratio of world money supply to international reserves changes or both, these changes will in part satisfy any increases in the demand for real money balances on the part of an economy whose income increases. Given that price and money/international reserve ratio changes are distributed evenly across countries, the only way a country will need to import reserves to satisfy its demand for money is when its demand for money rises more than proportionately when compared to the rest of the world. This will occur when its income rises in percentage terms more than the rise in income in the rest of the world.

The balance of payments for any country in such a model is nothing more than the increase in its reserves. When its reserves increase, the country has a surplus, and when the country's reserves decrease it has a deficit. With a fixed amount of world reserves, it is obvious that the sum total of all countries' balance of payments must equal zero.

From this we can see that given the above assumptions if a country's income grows faster than the rest of the world's income, it will have an overall balance of payments surplus. But, if it grows slower than the rest

of the world, it will have a balance of payments deficit. One therefore need only know whether a country is running surpluses or deficits in order to determine whether it is growing faster or more slowly than the rest of the world.

The above model unfortunately ignores some of the salient features of the actual world economy and how reserves are measured. In the first place, world reserves have not remained constant nor even approximately constant. In the second place, reserves are generally measured on a gross basis and not on a net basis. One country just by borrowing another country's deposits can increase its own gross reserves without reducing the other country's gross reserves. This is specifically true with regard to the currencies of a few countries, most predominantly the U.S. dollar.

The modification of the model in order to accomodate both the growth of total reserves and the measurement feature is relatively straightforward. Now, instead of expecting rapidly growing countries to have surpluses and slower growing countries to have deficits, we would expect rapidly growing countries to have larger surpluses and slower growing countries to have smaller surpluses or deficits.

Regardless of which specific result occurs, the proportion of world reserves held by rapidly growing countries should grow while the proportion of reserves held by slower growing countries should diminish.

In the case of a rise in the price of oil in terms of other goods, we found in Section II that there would be a discrete once-and-for-all rise in the income levels of oil-exporting countries relative to oil-importing countries. While this rise was measured in units of other goods, the selection of the numeraire should have no effect whatsoever on the relative rise.

From this we can deduce that the proportion of world reserves held by oil-exporting countries should show a once-and-for-all increase. Oil-exporting countries should experience abnormally large surpluses until the requisite reserve levels are attained, and then these surpluses should revert roughly back to their original levels. Oil-importing countries should have abnormally small surpluses or even deficits until the proportion of reserves again corresponds to the proportion of world income they derive. At such a time, their balance of payments surpluses again will more nearly revert back to their previous experience.

In summary, one would expect to find oil-exporting countries running large payments surpluses immediately following the rise in the price of oil. One would symmetrically expect oil-importing countries to see smaller surpluses or deficits immediately after the rise in the price of oil. In time, the occurrences of these abnormal surpluses or deficits should disappear. While a sufficient length of time has probably not passed to see clearly the reversion to previous balance of payments levels, the propositions will be examined from an empirical vantage point in the next section, Section IV.

IV. Oil and Trade: The Recent Experience

From the preceding several sections, certain analytic regularities appear quite plausible. On the trade balance side, it would be hard indeed to imagine the persistence of permanent trade balance deficits of the oil-importing countries due to a rise in the relative price of oil. Depending upon the specifics of the overall demand for goods -- both oil and other goods -- one could readily see a temporary deterioration in an oil-importing country's trade balance. But, this deterioration should reverse itself in due course.

The source of the reversal is far from clear. For oil-importing countries, expenditures should ultimately come back in line with overall income. The sources of the adjustment can be through reductions in the physical volume of imports of oil -- due both to demand reductions and home production increases -- or through increases in the physical volume of exports of other goods.

In the instance of reduced physical imports of oil, both the income effects and the substitution effects work in this direction. In both the demand and the home supply relationships, the higher price of oil leads to lower demand and higher supply and, therefore, less imports. Likewise, with the relative fall in income we would also find the demand for oil reduced via the income effects.

Adjustment of overall expenditures to income could also come about via goods other than oil products. On the production side, we should expect a fall in the output of other goods due solely to a rise in the relative price of oil. In addition, on the demand side of the relationship the pure substitution effects should lead to a rise in the demand for other goods. Nonetheless, the overall income effects may be sufficiently large to outweigh both the supply effects and the pure substitution effects. In such a case, the fall in the demand for other goods will exceed the fall in supply, and net exports of other goods would increase.

In looking at sixteen developed countries,¹³ trade balances, an interesting pattern emerges. Using quarterly trade balance data, not adjusted for seasonal variations, the aggregate of all sixteen countries' data

¹³ Australia, Canada, Denmark, France, Germany, Norway, Spain, Sweden, United Kingdom, United States, Austria, Belgium, Italy, Japan, Netherlands, and Portugal.

shows relatively slight variations for the eight quarters preceding the sharp rise in the price of oil. As is apparent from the data, much of even this perceived variation is due to the included seasonality.

In the four quarters following the elevation of the price of oil, there was a marked increase in the trade balance deficits of these sixteen countries. In 1972 the combined deficit was \$4 billion and in 1973 it rose to some \$6 billion. For the full year 1974 the deficit rose to almost \$40 billion. While the annual deficit in the trade balance rose sharply in 1974, the underlying quarterly pattern of deficits shown in Table 1 displays an interesting and revealing pattern.

Of the sixteen countries, several showed exceptionally marked deteriorations in their trade balances during the 1974 calendar year. Countries such as Spain, Japan, France, the U.K., the U.S., and Italy were the largest swing countries. In the case of Germany, the trade balance actually improved by a substantial amount. In Table 2 the yearly trade balances of the sixteen countries are listed in billions of U.S. dollars.

As can be seen from Table 2, literally every country, save Germany, showed a deterioration in its overall trade balance in 1974. Some of the countries, however, had much smaller deteriorations than others. Likewise, each of the major swing countries showed substantial improvement during the year.

Viewing the pattern as a whole, two distinct impressions emerge. First, at the outset, the rise in the price of oil was closely linked to a precipitous deterioration in industrial countries' trade balances. Second, the trade balance effects of the oil price rise were substantially dissipated by the fourth quarter of 1974 in both the aggregate and in a preponderance

TABLE 1

AGGREGATE QUARTERLY TRADE BALANCES
OF SIXTEEN INDUSTRIAL COUNTRIES,
1/72 - IV/74, N.S.A. ANNUAL RATES

<u>Year</u>	Quarter			
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>
1972	(8.4)	(8.4)	(4.8)	5.3
1973	(8.5)	(6.8)	(6.6)	(2.8)
1974	(36.0)	(51.0)	(50.3)	(19.7)
1975	(11.8)*			

^IExcludes Holland

TABLE 2

ANNUAL TRADE BALANCES OF MAJOR
DEVELOPED COUNTRIES 1972-1974

Billions of U.S. Dollars

() Implies Deficit

<u>Country</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>
Australia	1.9	2.7	(-0.2)
Austria	(-1.4)	(-1.7)	(-1.8)
Belgium	0.7	0.6	(-0.7)
Canada	1.3	1.5	0.7
Denmark	(-0.6)	(-1.4)	(-1.7)
France	(-0.9)	(-1.4)	(-6.9)
Germany	6.4	12.9	20.2
Italy	-0.8	(-5.6)	(-10.8)
Japan	5.2	(-1.6)	(-6.5)
Netherlands	(-0.8)	(-0.1)	(-0.8)
Norway	(-1.1)	(-1.6)	(-2.2)
Portugal	(-0.9)	(-1.1)	(-1.8)
Spain	(-3.0)	(-4.5)	(-8.4)
Sweden	0.7	1.5	0.1
U.K.	(-3.7)	(-8.4)	(-15.7)
U.S.	(-5.8)	2.3	(-2.4)
Total	(-2.8)	(-5.9)	(-38.8)

of the individual countries. In all, absorption was being brought back in line with income.

Perhaps the most striking result of the oil crisis was the fact that the physical volume of oil imports into these industrial countries showed little or no signs of abating after this unprecedented price rise. Put in the words of elasticities, the results imply that the short-run excess demand elasticities for oil are quite low.

While countries differ substantially both in trends and in individual monthly net import fluctuations, there is overall a surprising lack of sustained contraction in net imports after the near quadrupling of the price of crude oil. In Table 3 is a listing of indices of fourteen countries' monthly physical net imports of crude and products -- Canadian and Australian data were not available.

For many of the countries there is a noticeable reduction in the physical volume of net imports in the first half of 1974 as compared to either 1973 or 1972. However, by the second half of 1974 physical volume net imports appear to have reestablished their previous levels and in some instances far outstripped them.

It is virtually impossible to partition out the effects of the worldwide recession in 1974 and its effect on the net imports of oil into industrial countries. Nonetheless, the net import rate in the last half of 1974 exceeded the rate in 1973 for seven out of the thirteen countries. Even for the monthly rate for the year as a whole, four out of fourteen countries showed increases. While the mere fact of an increase in net unit imports is per se not exceptional, it becomes far more so in light of a quadrupling of the price and the world recession.

TABLE 3
INDICES OF PHYSICAL NET IMPORTS OF CRUDE
INTO SELECTED INDUSTRIAL COUNTRIES
AT MONTHLY RATES

Average for 1972 = 100

Index of Monthly Net Imports of Crude and Products
into Industrial Countries, 1972 = 100*

<u>Country</u>	<u>1972</u>	<u>1973</u>	Average to	1st half	2nd half
			date		
			<u>1974</u>	<u>1974</u>	<u>1974</u>
Austria	100	114	103	97	110
Belgium	100	78	73	57	99
Denmark	100	96	90	83	97
France	100	112	109	109	110
Germany	100	111	106	103	109
Italy	100	96	108	98	117
Japan	100	131	116	122	112
Netherlands	100	114	72	72	72
Norway	100	136	110	126	94
Portugal	100	99	132	103	163
Spain	100	91	111	104	118
Sweden	100	102	98	80	115
U.K.	100	108	104	113	95
U.S.	100	120	128	119	135

*Source: Various issues of Petroleum Industry Trends, Table E, "Net Imports of Crude and Products into Selected Industrial Countries." Excludes Canada and Australia. The data is based on survey and averages different kinds of crudes and products. It should be regarded as indicative rather than authoritative.

Whether net imports on balance have shown no effect or some effect when compared with trends or the level of world real income is a moot point. Irrespective of the precise effects, it is abundantly clear that over this time period the responses in the physical quantities of net imports have been slight relative to the rise in the price of oil. Referring back to the earlier discussions, absorption has not been substantially brought back into line with income from a fall in net imports of oil.

The above observation when combined with the overall trade balance results points directly to the category "other goods" being the primary adjuster. Net exports of other goods have climbed sharply throughout the oil price rise period. In the first few quarters of 1974, the trade balances of the oil-importing countries deteriorated sharply concomitant with modest reduction in the physical volume of oil imports. In the last quarter of 1974 and since then, the trade balances have come back into line. The reversion to old trade balance levels is accompanied by increases in the physical volume of oil imports. All told, this implies sharp reductions in net absorption of other goods by the oil-importing countries. Nonoil net exports of these countries have expanded sufficiently to virtually offset the trade balance effects of higher priced oil and increased physical net imports of oil.

These results imply very low net oil import elasticity figures for the oil-importing countries in the short run. Little can be concluded from these data as to the longer term effects.

The sharp rise in the price of oil also had a major impact on individual countries' balance of payments. From the theoretical analysis of the

preceding section, one would expect a once-and-for-all increase in the share of world reserves to be held by oil-producing countries. This increase, as with any trade balance changes, should at least in theory be solely a short-run phenomenon and not persist.

Using changes in official reserves as the balance of payments measure for a country, the industrial countries as a whole ran substantial surpluses in 1972 and 1973. In 1974, however, they appear to have run large deficits in the first few quarters and then returned to more normal balance of payments flows. For the two principal oil exporting countries -- Iran and Saudi Arabia -- there was a marked improvement in their balance of payments during 1974 with some sign of tapering off by year's end and the beginning of 1975.

In Table 4, quarterly balance of payments figures are provided for sixteen selected industrial countries plus Saudi Arabia and Iran. Of those 16 industrial countries, only three experienced an improvement in their balance of payments in the first half of 1974 over the full year 1973. Following along the same lines, only three of these countries had larger balance of payments deficits in the first quarter of 1975 (two countries' data were not available) than they had in the first quarter of 1974. In all, the absolute pattern is quite unmistakable. After a sharp initial deterioration in the first part of 1974, the balance of payments appear to revert to their previous levels.

The overall deterioration of the balance of payments in 1974 is even more pronounced than the above data suggest. In the year 1973, world reserves grew at a substantially slower rate than in 1974. Thus, while the industrial countries' reserves grew less rapidly in 1974, world reserves grew more rapidly. The share of world reserves held by the industrial countries fell more swiftly.

TABLE 4

QUARTERLY BALANCE OF PAYMENTS N.S.A
(CHANGES IN OFFICIAL DOLLAR RESERVES)
FOR SELECTED COUNTRIES
1972 - 1/1975

(Millions of U.S. Dollars)

Country	Quarterly Average for		1974				1975	
	1972	1973	1	2	3	4	1	2
Australia	704	-111	-228	-273	-815	-112	90	276
Austria	94	39	-113	-39	-369	340	-57	156
Belgium	99	308	-321	-152	532	186	548	94
Canada	87	-70	334	21	-314	16	2	-497
Denmark	33	118	-304	-222	-31	174	-6	-64
France	441	-372	-403	42	350	333	524	1142
Germany	1282	2341	-273	1351	-1691	186	1994	-1718
Italy	-177	89	233	-1382	2313	-657	-144	-103
Japan	761	-1530	179	1003	-259	350	634	452
Netherlands	247	441	-544	-478	1075	358	239	-436
Norway	43	62	214	-162	241	61	-214	360
Portugal	92	132	-164	-113	-63	-145	-190	n.a.
Spain	436	439	-302	-369	356	28	-219	n.a.
Sweden	116	238	-241	-500	-131	78	93	554
U.K.	-234	207	-32	267	477	-249	385	-939
U.S.	-10	308	210	360	760	350	595	-122
Total	4014	2639	-1755	-646	2431	1297	4274	-885
Saudi Arabia	264	344	987	2223	4461	2737	4733	1407
Iran	85	69	923	3279	1210	1723	-52	1355
Total	349	413	1910	5502	5671	4471	4681	2762

On the other side of the same issue, reserves held by Saudi Arabia and Iran rose at unprecedented rates in each quarter of 1974. The share of world reserves held by the Middle East in general rose from 6.2 percent at the end of 1973 to 14.8 percent at the end of 1974. In Table 5 the share of world reserves held by major areas of the world are listed by quarter for 1973 and 1974.

The big change in the share of world reserves is the rise in the share held by the Middle East and to a lesser extent other less developed countries. These increases were offset by equivalent falls in the industrial and developed world.

To summarize, the empirical evidence to date suggests that the trade balances of net oil-importing countries showed marked temporary deficits after the rise in the price of oil. Within a year after the quadrupling of the price of oil, net physical units imported showed little evidence of contracting at the same time as trade balances reverted to former levels. In all, the adjustment of expenditure levels to income levels occurred almost exclusively through nonoil commodities.

The balance of payments of the oil importing countries also showed a sharp, but temporary, deterioration. Overall, the share of world reserves held by the Middle East more than doubled from the end of 1973 to the end of 1974. These empirical observations are consistent with the model developed in the main text of the paper. The absorption approach to the balance of trade and the monetary approach to the balance of payments appear to date, at least, quite adequate to encompass the oil crisis. Their implications, however, are often ignored. Extending these approaches in time leads one to the conclusion that the oil crisis is not a balance of trade or a balance of payments crisis in anything other than the shortest of runs.

TABLE 5
PERCENTAGE SHARE OF WORLD RESERVES BY QUARTER
1973, 1974 AND 1975

	1973				1974				1975
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>
Industrial	67.4	65.5	64.6	62.5	60.4	56.6	56.1	54.4	54.9
Other Developed	12.4	12.8	13.2	13.2	12.6	11.1	10.4	9.6	8.9
Middle East	5.0	5.3	5.7	6.2	7.5	10.4	12.7	14.8	16.4
Other Less Developed	15.2	16.4	16.5	18.1	19.5	21.9	20.8	21.2	19.4

REFERENCES

1. Alexander, Sidney S., "Problems for a Task Force on International Oil: Financing, Prices, and Security of Supply," M.I.T. unpublished manuscript, February 1975.
2. _____, "Draft of Task Force Report on International Financial Consequences of the Oil Price Rise," M.I.T. unpublished manuscript, July 1975.
3. First National City Bank, Monthly Economic Letter, June 1975.
4. International Bank for Reconstruction and Development, "Prospects for the Developing Countries," unpublished report, July 1974.
5. Levy, W. J., "Future OPEC Accumulation of Oil Money: A New Look at a Critical Problem," unpublished report, June 1975.
6. Morgan Guaranty Trust Company of New York, World Financial Markets, January 21, 1975.
7. Organization for Economic Cooperation and Development, Economic Outlook, December 1974.

Date Due

BASEMENT

~~FEB 26 '79~~

APR 25 '79

JUN 18 '79

DEC 11 '79

APR 15 '80

✓

FEB 25 '82

3/29/82

DEC 11 '82

Lib-26-67

T-J5 143 w no.804- 75
Agmon, Tamir B/International diversifi
725163 D*BKS 00019883



3 9080 000 646 197

T-J5 143 w no.805- 75
Gordon, Judith/Describing the external
725175 D*BKS 00019878



3 9080 000 646 072

HD28.M414 no.806-75
Bodie, Zvi. /Variance minimization a
725868 D*BKS 00019846



3 9080 000 645 371

T-J5 143 w no.807- 75
Rosoff, Nina. /Educational interventio
725876 D*BKS 00019850



3 9080 000 645 470

T-J5 143 w no.808- 75
Marsten, Roy E/Parametric integer prog
725861 D*BKS 00019847



3 9080 000 645 413

T-J5 143 w no.809- 75
Agmon, Tamir B/Trade effects of the oi
725863 D*BKS 00019866



3 9080 000 645 793

HD28.M414 no.810- 75
Agmon, Tamir B/Financial intermediatio
725822 D*BKS 00019867



3 9080 000 645 819



3 9080 000 164 910

811-75

